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Studies on the external morphology of the eggs of *Eurygaster maura* (Linnaeus, 1758) (Heteroptera: Scutelleridae)

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ABSTRACT. External morphology of egg of *Eurygaster maura* (LINNAEUS, 1758) was investigated by light (LM) and scanning electron microscope (SEM). The females were collected from Ankara, Ayaş, Asartepe and maintained under the laboratory conditions. Each female was shown to deposit generally 14 green eggs in a mass. The spherical shaped eggs were 1.04 mm in length and 0.96 mm in width. The first external evidence of embryonic development was the appearance of two red eye spots opposite each other beneath the aero-micropylar processes followed by appearance of a blackish T-shaped egg burster between the eye spots. Egg surface are covered with polygons. They have 20 to 22 aero-micropyles in a shape of truncated cones between polygons.

KEY WORDS: Heteroptera, Scutelleridae, *Eurygaster maura*, chorion, external morphology, aero-micropylar processes, egg-burster, scanning electron microscope

INTRODUCTION

The taxonomic and phylogenetic importance of eggshell structure in pterygote insects has been demonstrated in various orders at different levels (HINTON 1981, SALKELD 1983, 1984, MARGARITIS 1985). Research on eggs of Heteroptera has been reviewed by SOUTHWOOD (1956), COBBEN (1968), and HINTON (1981). Afterwards, egg surface structure of Heteroptera species including Scutelleridae has been reported by many authors, however accurate knowledge of the egg morphology still lacks in many taxonomic groups (ESSELBAUGH 1946, GRIGOROV 1988, JAVAHERY 1994, SIMICZYJEW 1994, SULUDERE et al. 1999, BUNDY & MC PHERSON 2000, CANDAN et al. 2001, 2005a, b, WOLF & REID 2003, 2004, CANDAN & SULUDERE 2001, 2003, 2006). It is the first time that the egg structure of

Eurygaster maura has been examined in detail by both light and scanning electron microscope

MATERIAL AND METHODS

Adults of *Eurygaster maura* (LINNAEUS, 1758) were collected from Ankara, Ayaş, Asartepe (27.5.2005). Fresh eggs were obtained from a colony maintained in breeding cages under laboratory conditions. Approximately 30 eggs were examined and measured with Olympus SZX12 light microscope. For scanning electron microscopy, cleaned and dried eggs were mounted with double-sided tape on SEM stubs. Then they were coated with gold using a Polaron SC 502 Sputter Coater, and examined with a Jeol JSM 6060 SEM operated at 15 kV at Gazi University (Faculty of Arts and Science, Electron Microscopy Unit, Turkey).

RESULTS AND DISCUSSION

E. maura is the most destructive pest in the cereal fields in Turkey. It is caused great losses to the wheat and barley crops in Anatolia; therefore, it is economically important species (LODOS 1986). The eggs are laid in two or more rows and are glued to the cotton cover of containers in the laboratory. The egg mass generally consists of 14 eggs (Figs. 1 a-d). Several publications state that the eggs of Heteroptera are deposited in upright position and attached to each other as well as to the substrate with an adhesive secreted by the female (SOUTHWOOD 1956, COBBEN 1968, HINTON 1981, JAVAHERY 1994, CANDAN & SULUDERE 2006). The spherical-shaped eggs are in average 1.04 mm in length and 0.96 mm in width (Figs. 1 a-d, 2 a-b). In two other *Eurygaster* species, *E. alternata* and *E. integriceps*, eggs are also spherical or barrel shaped. Chorionic surface in the eggs of *E. maura* is smooth and shiny like that of *E. alternata* and *E. integriceps* (JAVAHERY 1994). Newly laid eggs were green but then their color slightly changes and starts pigmentation under the chorion in the later phase. Then, red eye spots and egg burster have appeared in the last phase of embryonic development (Figs 1 c-d). It is reported that the changing of egg color is normal during embryogenesis in insects including most of the Scutelleridae and Pentatomidae (HINTON 1981, JAVAHERY 1994, CANDAN et al. 2005 a, b).

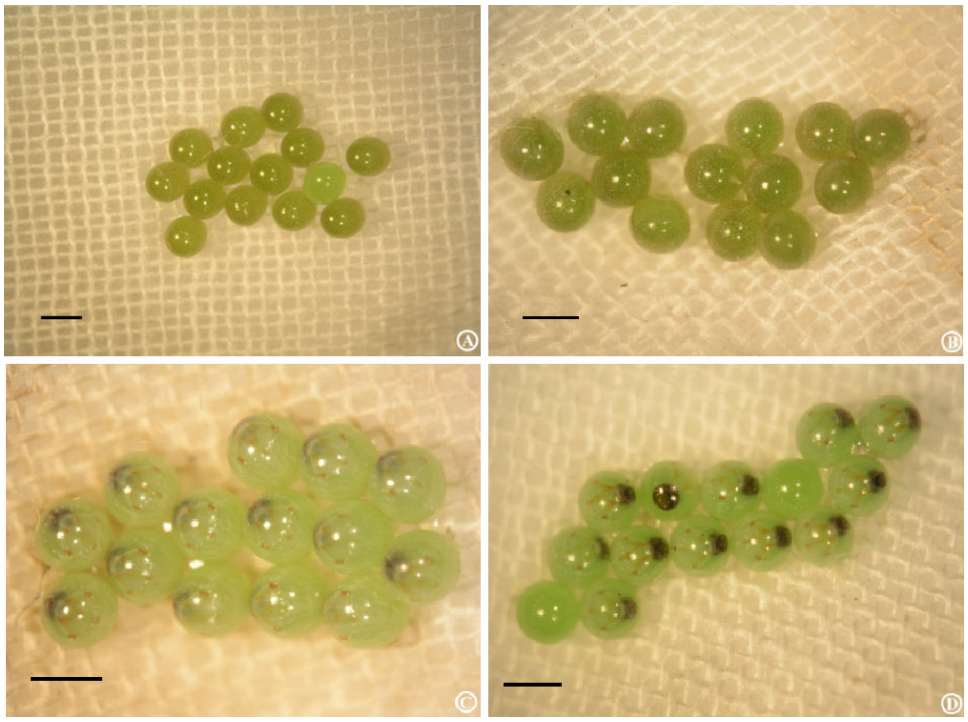

Fig. 1. A-D. LM photos in different phases of eggs masses of *Eurygaster maura*. a. Newly laid egg mass, b. Starting of pigmentation under the chorion in the later phase, c. Appearance of red eye spots and egg burster, d. Egg-burster and red eye spots in the last phase of embryonic development (Scale bar: 1 mm).

The egg of *E. maura* is covered with polygonal reticulated pattern over the surface including operculum (Figs 2 c-e). One or more dome shaped granules are situated in the central area of some polygons (Figs 2 c-d). Although similar structures are sparsely distributed on the chorion of *Psacascta exanthematica* Scopoli, 1763, there are not seen any polygonal pattern (CANDAN & SULUDERE 2003).

In *Eurygaster maura,* there is a ring of widely separated aero-micropyles around the anterior pole. The well-marked operculum intersects the ring of 20-22 aero-micropyles. Their shapes are similar to a truncated cone with an orifice at the apex (Figs 2 a, c). According to HINTON (1981), the number of micropylar processes is different in the *Eurygaster* species, such as *E. austriacus* (16-19), *E. integriceps* (16–18) and *E. testudinarius* (20–23). Micropylar structures are raised from the chorion around the cap in Pentatomidae, but they tend to project from the innerside of the shell in Acanthosomidae, Cydnidae, Scutelleridae, and Thyrocoridae (JAVAHERY, 1994). The aero-micropylar process

has a central canal for the passage of sperm and serves for respiratory interchange in many species of Heteroptera including *E. maura* (SOUTHWOOD 1956, COBBEN 1968, HINTON 1981, JAVAHERY 1994).

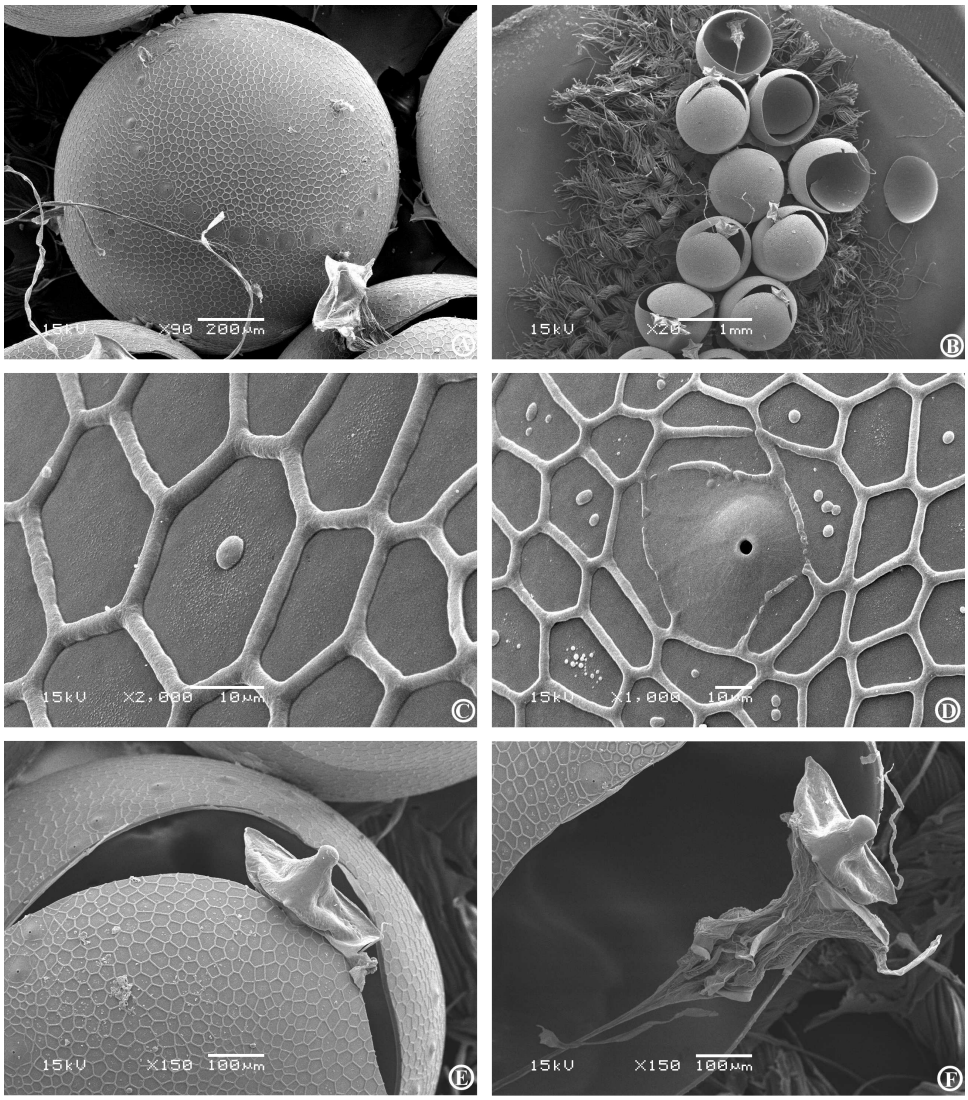

Fig. 2. A-F. SEM photos of eggs of *Eurygaster maura*. a. General view of eggs of *E. maura*. b. Hatched egg mass. c. Polygonal reticulated patterns with dome shaped granules. d. Aero-micropyle with orifice. e-f. T shaped egg burster in hatched eggs.

The egg-burster becomes visible when the embryo is well developed and can be seen to move during the last day of embryonic development because of thin and transparent shell (Figs 1 c-d). The hatching line is cracked an irregular split of the chorion at eclosion (Figs 2 b, e). The egg-burster is thick and highly sclerotized. It is easily seen with a dark T-shaped or triangular configuration in the hatched egg (Figs 2 e, f). T-shaped egg-burster is common in most of the Scutelleridae and Pentatomidae and a Y- shaped egg burster is found in Acanthosomatidae, Cydnidae, Thyrocoridae (SCHUMACHER 1917; SOUTHWOOD 1956, PUCHKOVA 1959, 1966, COBBEN 1968, HINTON 1981, JAVAHERY, 1994). Hatching begins by peristaltic contraction of body of prolarva from the back to the front forcing the sharp sclerotized toot of the egg- burster against the anterior pole of the egg. The egg-burster on hatched eggs does not separate from the eggs and adheres by its tail to the inner lateral side of the egg (Figs. 2 b, e-f). The egg burster has taxonomical importance as well as the egg shape, the number of micropylar projections, and the chorionic pattern (PUCHKOVA 1966, HINTON 1981).

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